No data exist concerning the presence of potential traditional cultural properties along the pipeline corridor between the Klondike Flats site and Crescent Junction site. On the basis of Class I cultural resource inventory results, tribal interviews, and published and unpublished literature, the likelihood of their occurrence and estimated density on the site are low (on a scale of low-medium-high-extremely high) for traditional cultural properties associated with the Southern Ute Tribe, Navajo Nation, and Hopi Tribe. The likelihood of their occurrence and estimated density are medium for traditional cultural properties associated with the Ute Mountain Ute Tribe and White Mesa Ute Tribe and medium to high for properties associated with the Uintah-Ouray Ute Tribe (Fritz 2004, in progress).

3.3.19.9 Visual Resources

Visual resources along the Klondike Flats portion of the Crescent Junction pipeline route are described in Section 3.2.18.9. Visual resources along the remainder of the route, between the Klondike Flats and Crescent Junction sites, consist primarily of flat to gently rolling, light beige and light gray desert plains that are sparsely vegetated by saltbush and bunchgrass. The background scenery along this portion of the route varies. Along the east side of the corridor lie the rugged red and beige rocks of Arches National Park; along the west side of the corridor near the Klondike Flats site lie the smooth, rounded, buff-colored bluffs of Mancos Shale.

Approximately 3 miles north of the Klondike Flats site, the bluffs on the west side of the corridor come to an end and are replaced by the wide, flat expanse of the gray Mancos Shale desert. Visual resource designations along the entire route from the Moab site to the Crescent Junction site include Class III areas (approximately 80 percent of the route), Class IV areas (approximately 10 percent of the route), and the Class II area within Moab Canyon (approximately 10 percent of the route). Section 3.1.15 presents descriptions of the various visual resource classes.

The portion of the pipeline route from Klondike Flats to Crescent Junction is visible to travelers on US-191 for approximately 3 miles north of the Klondike Flats site. At that point, the route veers off to the northeast along an existing pipeline route and is not visible to the general public until it crosses I-70 near the town of Crescent Junction.

3.4 White Mesa Mill Site

The proposed White Mesa Mill disposal site (White Mesa Mill site) is located in San Juan County, Utah, approximately 5 miles south of Blanding, Utah. Facilities consist of a uranium-ore processing mill, ore storage pad, and four lined tailings cells with leak-detection systems and ground water monitor wells. The facilities are situated within a 5,415-acre area of private property owned primarily by IUC. The mill itself occupies approximately 50 acres, and the tailings disposal ponds occupy approximately 450 acres. The site is accessible from a half-mile-long private road connected to US-191.

Since early 1997, the mill has processed more than 100,000 tons from several additional feed stocks. Since its inception, the mill has processed a total of 4,083,144 tons of materials. This total is for all processing periods combined. Annual production of yellowcake has been as high as 3.75 million pounds per year in the 1985–1990 period. In comparison, the Moab contaminated materials are estimated at 11.8 million tons and have an in situ dry density between 90 (slimes) and 97 pounds per cubic foot. A more detailed summary of White Mesa Mill operations is provided in Appendix G.

3.4.1 Geology

The existing White Mesa Mill site is in the central part of the Colorado Plateau physiographic province known as the Canyonlands section. The site is located mostly on White Mesa, which slopes gently southward with elevations decreasing from about 5,700 to 5,400 ft. The southernmost part of the site is in a canyon that drops down to about 5,000 ft in elevation and contains an unnamed drainage that is a tributary to the Right Hand Fork of Cottonwood Wash. IUC (2003) provides a detailed description of the site geology.

3.4.1.1 Stratigraphy

Bedrock at the site is covered by up to 25 ft of unconsolidated silt and very fine-grained sand. Some alluvial material (sand and gravel) may also be present in the eastern part of the area. A generalized stratigraphic column of the White Mesa Mill site is shown on Figure 3–37.

In the north part of the millsite, the first bedrock formation present is a few feet of Mancos Shale. Below the Mancos Shale is the Dakota Sandstone, with an average thickness of 39 ft consisting mainly of sandstone and shale. Below the Dakota is the Burro Canyon Formation, which is approximately 75 ft thick.

Beneath the Burro Canyon is the thick Morrison Formation, which is composed of four members in this area. In descending order (from youngest to oldest) from the surface, the members and their respective thicknesses in the site area are: Brushy Basin, 275 ft; Westwater Canyon, 60 ft; Recapture, 120 ft; and Salt Wash, 100 ft.

The Summerville Formation, consisting mainly of siltstones, is below the Morrison. Below the Summerville are the thick Entrada and Navajo Sandstones. These sandstones were deposited mainly in eolian environments, are highly permeable, and form the principal aquifer in the region.

3.4.1.2 Structure

The White Mesa Mill site is in the south part of the ancestral Paradox Basin, in the west part of the Blanding Basin subprovince (see Figure 3–1). Rock formations in the immediate area are nearly flat lying. At the millsite, bedrock dips generally 0.5 to 1 degree to the south (IUC 2003). No faults are known in the site area or within at least a 5-mile radius.

3.4.1.3 Geologic Resources

No oil and gas resources are known to occur beneath the site. Evaporite deposits such as salt (halite) and magnesium salts (carnallite) occur in the Paradox Formation at the site; potash occurs farther north in the Paradox Basin. Recovery of these deposits would be uneconomical because of their great depth and the relative thinness of the deposits compared to other areas in the Paradox Basin.

Although uranium and vanadium deposits are known to exist 5 miles to the west and northwest of the millsite, the potential for these deposits on the site is low. Sand and gravel deposits may underlie the surface of the eastern part of the site (Gloyn et al. 1995). However, these deposits are probably scattered and insignificant (IUC 2003).

Age	Formation and Members	Thickness (ft)
Late Cretaceous	Mancos Shale	Up to 50 preserved
Early Cretaceous	Dakota Sandstone	30–50
	Burro Canyon Formation	60–90
Jurassic	Morrison Formation, Brushy Basin Member	275
	Morrison Formation, Westwater Canyon Member	60
	Morrison Formation, Recapture Member	120
	Morrison Formation, Salt Wash Member	100
	Summerville Formation	50–100
	Entrada Sandstone	300–500
	Navajo Sandstone	500–700
	Kayenta Formation	200
	Wingate Sandstone	300–400
Pennsylvanian to Triassic	Various formations from Pennsylvanian to Triassic age	2,000–3,000
	Paradox Formation	1,000–3,000

Figure 3–37. Generalized Stratigraphic Column for the White Mesa Mill Site

3.4.1.4 Geologic Hazards

Montmorillonite is present in the Brushy Basin Member of the Morrison Formation. As described in Section 3.2.1.4 and Section 3.3.1.4, changes in water content cause swelling and shrinking that can lead to subsidence. This hazard is a problem only at the edges of and on the slopes of White Mesa where the member is exposed. The Brushy Basin Member is 100 to 150 ft below the surface over most of the site and in the area being considered for a disposal cell; therefore, overburden pressures from the overlying formations and lack of exposure would prevent shrinking and swelling from becoming a problem.

The hazard exists for landslides and slumps in the canyons bordering the site where the Brushy Basin Member of the Morrison Formation forms unstable slopes (Harty 1991). Here, mudstones of the Brushy Basin Member offer little support to competent, thick sandstones of the overlying Burro Canyon Formation, especially in areas of seepage.

Earthquake risk and seismic hazard in the site area are low (Wong and Humphrey 1989). The site area is in Uniform Building Code 1, indicating the lowest potential for earthquake damage (Olig 1991).

The site area has a moderate-to-high radon-hazard potential for occurrence of indoor radon based on the geologic factors of uranium concentrations, soil permeability, and ground water depth (Black 1993). The high rating stems from the relatively high concentration of uranium in the Salt Wash Member of the Morrison Formation, the relatively high soil permeability caused by shrinking and swelling of the soils derived from the Brushy Basin Member of the Morrison Formation, and the relatively deep depth to ground water (shallow depth to water retards radon migration).

3.4.2 Soils

The soil type in this area is primarily Blanding very fine sandy loam (USDA 1962), which is deep, well-drained, and of medium texture. The soil is moderately permeable and has slow surface runoff, so water can move through the profile readily and roots can penetrate easily. Because of the moderate infiltration characteristics, erosion potential is low. However, the flows resulting from thunderstorms are nearly instantaneous. When these soils are barren, they are considered to have a high potential for wind erosion.

Also occurring in small areas near the site is the soil type Mellenthin, a very rocky fine sandy loam (USDA 1962). This soil type is very similar to Blanding very fine sandy loam but is much shallower, often only 15 inches deep. The shallow depth influences the current and potential vegetation communities and, consequently, the wildlife habitat. It is also less suitable for reseeding because it has only moderate permeability, medium runoff, and low moisture-holding capacity. Table 3–37 lists characteristics of the soil at the White Mesa Mill site.

3.4.3 Air Quality

3.4.3.1 Ambient Quality

Prior to construction of the White Mesa Mill, comprehensive evaluations of ambient air quality conditions at the millsite were conducted in the late 1970s and documented in the *Environmental Report, White Mesa Uranium Project, San Juan County, Utah* (Dames & Moore 1978), and also in the *Final Environmental Statement Related to Operation of White Mesa Uranium Project* (NRC 1979). This section summarizes these past investigations.

The State of Utah has adopted EPA standards for gaseous emissions and particulates as applicable throughout the state. Federal and state primary and secondary air quality standards are presented in Table 3–4. Primary ambient air quality standards define the relative air quality levels judged necessary, with an adequate safety margin, to protect the public *health*. Secondary ambient air quality standards define levels of air quality that are judged necessary to protect the public *welfare* from any known or anticipated adverse effects of a pollutant.

The White Mesa Mill site is located within the Four Corners Interstate Air Quality Control Region, which encompasses parts of Colorado, Arizona, New Mexico, and Utah. Air quality for any given area is evaluated according to a classification system that was established for all air quality control regions in the United States. The classification system rates the five major air pollutants (particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, and photochemical oxidants) as having a priority of I, II, or III. A priority I rating means that a portion of the region is significantly violating federal standards for a particular pollutant, and special emission controls are needed. If the emissions are predominantly from a single point source, then it is further classified as IA. A priority II indicates a better quality of air in the region; a priority III rating classifies the highest quality. The priority classifications for the Four Corners Air Quality Control Region, which includes the White Mesa Mill site, are as follows:

	Sulfur Dioxides	Particulate Matter	Nitrogen Oxides	Carbon Monoxide	Photochemical Oxidants
Priority Classification	IA	IA	III	III	III

Ambient pollutant concentrations that define the classification system are outlined in Table 3–38.

Table 3–38. Federal Regional Priority Classifications Based on Ambient Air Quality

Pollutant	Averaging Time	Air Quality for Each Priority Group[a,b]		
		I	II	III
Sulfur oxides	Annual 24 hour 3 hour	>100 µg/m³ >455 µg/m³	60–100 µg/m³ 260–455 µg/m³ 1,300 µg/m³	<60 µg/m³ <260 µg/m³ <1,300 µg/m³
Particulate matter	Annual 24 hour	>95 µg/m³ >325 µg/m³	60–95 µg/m³ 150–325 µg/m³	<60 µg/m³ <150 µg/m³
Carbon monoxide	8 hour 1 hour	>14 mg/m³ >55 mg/m³	NA	<14 mg/m³ <55 mg/m³
Nitrogen dioxide	Annual	>110 µg/m³	NA	<110 µg/m³
Photochemical oxidants	1 hour	>195 µg/m³	NA	<195 µg/m³

[a] In the absence of measured data to the contrary, any given region containing an area whose 1970 "urban place" population exceeds 200,000 will be classified priority I. All others will be classified priority III. Hydrocarbon classifications will be same as for photochemical oxidants. There is no priority II classification for carbon monoxide, nitrogen dioxide, and photochemical oxidants. Hydrocarbon classifications will be the same as for photochemical oxidants.
[b] µg/m³ = micrograms per cubic meter; mg/m³ = milligrams per cubic meter.

Air quality at the White Mesa Mill site area has a priority rating of IA, which signifies a violation of federal air standards for particulate matter and sulfur dioxide, both of which are attributable to emissions from fossil-fueled power plants located within the region. However, none of the power plants lie within 31 miles of the millsite, which suggests that the air quality in the vicinity of the site may be better than the priority IA classification indicates.

The State of Utah monitors total suspended particulates and sulfur dioxide at a station located 66 miles west of the millsite at Bull Frog Marina (Lake Powell). Except for the short-term (24-hour) particulate measurement, all reported values were well below the federal and State of Utah air quality standards. The 24-hour particulate violations are believed to have been caused by dust blown by high winds.

On the basis of data collected from sampling locations at the White Mesa Mill site for 1 year, dust-fall averaged 33 grams per square meter (g/m^2) per month; the highest monthly average was 102 g/m^2 occurring in August. Total suspended particulates monitoring from October 1977 through February 1978 produced a geometric mean of 18 $\mu g/m^3$. This value is well below the federal and state air quality standard of 50 $\mu g/m^3$. The maximum 24-hour concentration was 79 $\mu g/m^3$, or approximately one-half of the federal and state standard of 150 $\mu g/m^3$. Sulfation-rate monitoring at the White Mesa Mill site indicates that sulfur dioxide concentrations at the site are less than 0.005 parts per million (ppm). The federal and state standard for the annual average of sulfur dioxide is 0.03 ppm.

At the time of the 1978 environmental report (Dames and Moore 1978) and final environmental statement (NRC 1979), the Four Corners Air Quality Control Region had an air quality priority IA rating. This was an important consideration at the time because there was significant concern that windblown dust from coal storage stockpiles and air emissions (i.e., sulfur dioxides, particulate matter, carbon monoxide, and nitrogen oxides resulting from combustion of coal to power the mill) associated with operation of the mill would further degrade air quality in the region. However, the use of coal to fire boilers at the mill was discontinued in 1990. By 1994, propane was used to fire all process and heating boilers. The mill is no longer required to perform sulfation rate monitoring. NRC's final environmental statement concluded that operation of the White Mesa Mill would not have any significant impact upon regional air quality.

Currently, nonradioactive air emissions from the White Mesa Mill are regulated by the State of Utah in accordance with an air quality permit (1997 Approval Order DAQE-884-97). This permit establishes annual emission limits for the mill's yellowcake dryers and the vanadium circuit scrubber. Requirements for controlling dust from roads and fugitive sources are also included in this permit. The permit also specifies that the mill must comply with National Emissions Standards for Hazardous Air Pollutants for radon emissions (40 CFR 61). The air quality permit requires that particulate emissions (PM_{10}) to the atmosphere shall not exceed 0.40 pound per hour for each yellowcake dryer and 2.50 pounds per hour for the vanadium circuit scrubber. Compliance testing of the scrubber and dryers must be performed within 180 days of the startup of a new emission point or the inclusion of an emission point in the permit and, thereafter, if and when directed by UDEQ. Monitoring for radionuclide emissions is conducted while the mill is operating.

To ensure compliance with applicable air quality standards and the requirements of the permit, restrictions are in place that control emissions from specific pieces of milling equipment and operations. These restrictions ensure compliance with emission levels specified in the permit by controlling ore processing rates and propane gas consumption rates. The mill is required to submit an annual emission inventory to UDEQ. Table 3–39 summarizes the annual emission inventory for the key criteria emissions for the last 6 years. The key criteria emissions are PM_{10}, sulfur oxides, nitrogen oxides, volatile organic compounds, and carbon monoxide.

The NRC license also requires the mill to monitor total particulate matter. The mill's environmental air monitoring program uses four high-volume continuous air sampling stations; filters from each station are changed approximately every 7 days. Data collected from the air monitoring program are reported to NRC in semiannual effluent monitoring reports as required by 10 CFR 40.65.

Table 3–39. Air Emission Inventory for Key Criteria Emissions (tons per year)

Year	PM_{10}	Sulfur Oxides	Nitrogen Oxides	Volatile Organic Compounds	Carbon Monoxide
1997	0.775	0.255	3.859	2.120	7.257
1998	-	-	-	-	-
1999	2.57	1.15	18.11	2.16	14.14
2000	1.9	1.47	14.61	2.76	11.78
2001	-	-	-	-	-
2002	0.68	0.98	9.04	1.80	11.49

Environmental air monitoring data collected to date indicate that concentrations of total suspended particulate matter resulting from mill emissions are in compliance with the applicable regulatory limit of 50 $\mu g/m^3$ and do not vary significantly from ambient concentrations of particulate matter measured at the mill. During a recent mill run (April–October 1999), average concentrations for particulate matter ranged from 20 to 40 $\mu g/m^3$. By comparison, concentrations of particulate matter were measured at 26 to 44 $\mu g/m^3$ during a period in 2001 when operations were suspended at the mill.

3.4.3.1 Visibility

Southeastern Utah is known for its scenic vistas and attracts many visitors each year. Stack emissions (primarily steam) from the mill are visible to the public traveling US-191 east of the White Mesa Mill site. These emissions are not visible from the major recreational areas in the vicinity of the mill.

In its 1979 final environmental statement, NRC concluded that there would be no significant impacts to air quality as a result of the White Mesa Mill operations. NRC concluded that, although the operation of the mill would result in a slight increase in concentrations of particulate matter and ambient gaseous emissions, the concentrations would be below federal and state air quality standards, and they would not significantly degrade the regional air quality (NRC 1979).

Beginning with the 1994/1995 mill run, propane was used to fire all process and heating boilers. As a result, impacts to visibility resulting from windblown dust (from coal storage stockpiles) and from air emissions associated with the combustion of coal were significantly reduced.

3.4.4 Climate and Meteorology

The climate of the site area in southeastern Utah is classified as semiarid continental. Data from the National Weather Service station in Blanding (approximately 5 miles north of the site) are considered representative of the site weather conditions. Weather data summarized by the Utah Climate Center for the town of Blanding are presented in the following discussion (Pope and Brough 1996).

Although varying somewhat with elevation and terrain, the climate in the White Mesa Mill area is also considered as semiarid, with normal annual precipitation of about 13.4 inches. Precipitation is characterized by wide variations in annual and seasonal rainfall punctuated by long periods of drought. Most precipitation is in the form of rain; the average annual snowfall of about 40 inches accounts for about 29 percent of the annual total precipitation. The region has two separate rainfall seasons; one is in late summer to early autumn (July to October) and corresponds to the southwest monsoon season, and one is during the winter months of December to March. The mean annual relative humidity is about 44 percent and is normally highest in January and lowest in July.

The average annual Class A pan evaporation rate is 68 inches; the largest evaporation rate typically occurs in July (IUC 2003). Warm summers and cold winters typify the weather in the Blanding area. The mean annual temperature in Blanding is about 50 °F; the mean annual maximum is 63.6 °F, and the mean annual minimum is 36.4 °F. The coldest temperature recorded was –23 °F in February 1933 and the hottest temperature was 110 °F in June 1905. January is the coldest month, with an average low temperature of 16 °F and an average high temperature of 38 °F. July is the hottest month, with an average high temperature of 89 °F and an average low temperature of 57 °F.

Winds are usually light to moderate in the area during all seasons, although occasional stronger winds may occur in the late winter and spring. Winds are from the north and northeast approximately 30 percent of the time and from the south and southwest about 25 percent of the time. Winds are generally less than 15 mph; wind speeds faster than 25 mph occur less than 1 percent of the time.

3.4.5 Ground Water

3.4.5.1 Hydrostratigraphy

The White Mesa Mill site is underlain by unconsolidated alluvium and indurated sedimentary rocks of Cretaceous and Jurassic age consisting primarily of sandstone and shale. Ground water in the vicinity of the site occurs primarily as perched water in the Burro Canyon Formation of Cretaceous age, and under confined conditions in the Entrada and Navajo Sandstones of Jurassic age. The Entrada and Navajo Sandstones constitute the primary aquifer in the area of the White Mesa Mill site. The Entrada and Navajo Sandstones are separated from the Burro Canyon Formation by approximately 1,000 ft of unsaturated materials of the Morrison and Summerville Formations of Jurassic age that have a low average vertical permeability and form a significant aquitard.

3.4.5.2 Ground Water Occurrence

Perched ground water beneath the site occurs primarily within the Burro Canyon Formation. The saturated thickness of the perched ground water zone generally increases to the north of the site. Perched ground water is supported within the Burro Canyon Formation by the underlying, fine-grained Brushy Basin Member of the Morrison Formation. The contact between these two units generally dips to the south-southwest beneath the site. The permeability of the Burro Canyon Formation is generally low; no significant joints or fractures are documented by cores from any wells or borings in the area. Any fractures in cores collected from site borings were typically cemented and had no open space. Some conglomeratic zones within the perched ground water system were observed east to northeast of the tailings cells at the site and may represent a relatively continuous zone of higher permeability. This zone is hydraulically cross gradient to upgradient of the tailings cells with respect to perched ground water flow. The higher permeability zone may extend beneath the southeastern margin of the cells but does not appear to exist downgradient (south-southwest) of the tailings cells based on current data.

Perched ground water was noted at depths of approximately 50 to 110 ft below land surface in the vicinity of the tailings cells at the site (IUC 2003). Information collected by the State of Utah Division of Radiation Control in September 2002 indicated that depth to ground water ranged from 17 to 110 ft and averaged 71 ft. The saturated thickness of the perched ground water zone ranges from approximately 82 ft in the northeast portion of the site to less than 5 ft in the southwest portion of the site (IUC 2003). Perched ground water flow at the site is generally to the south-southwest, and hydraulic gradients range from 0.04 ft/ft to less than 0.01 ft/ft downgradient of the tailings cells. The ground water gradient changes from generally southwesterly in the western portion of the site to generally southerly in the eastern portion of the site. In general, perched ground water levels have not changed significantly in most areas. An increase in water levels in the east and northeast portions of the site since 1994 are probably attributable to seepage from two wildlife ponds (IUC 2003). This activity may affect the ground water flow regime in the perched ground water system in this area.

Recharge to the perched ground water system is through percolation of rainfall and snowmelt through surface soils over the mesa top, along with infiltration of water from the wildlife ponds. Perched ground water at the millsite discharges where the Burro Canyon Formation crops out in springs and seeps along Westwater Creek Canyon and Cottonwood Canyon to the west-southwest of the site and along Corral Canyon to the east of the site. The primary discharge point for perched water flowing beneath the tailings cells is believed to be Ruin Spring in Cottonwood Canyon, approximately 2.5 miles south-southwest of the millsite. Ruin Spring is the only spring that flows consistently. The Ute Mountain Ute Tribe has indicated that it has performed extensive surveys of the seeps and springs on the perimeter of the geographic White Mesa, including tribal and BLM land, and that Ruin Springs is not the only consistently flowing spring on the mesa. DOE has requested these data from the tribe and will address the data once they are received.

The Entrada and Navajo Sandstones are prolific aquifers beneath and in the vicinity of the White Mesa Mill site. Because water wells at the site are screened through both of these units, they will be considered as a single aquifer. Ground water in the Entrada/Navajo aquifer is under artesian pressure, rising 800 to 900 ft above the top of the Entrada contact with the overlying Summerville Formation. Static ground water levels are 390 to 500 ft below ground surface. The site is located within a region that has a dry to arid continental climate and an average annual precipitation of 13.4 inches (IUC 2003). Recharge to regional aquifers occurs primarily along the mountain fronts (such as the Henry Mountains to the west and the Abajo Mountains to the north) and along the flanks of folds (such as Comb Ridge Monocline to the west).

3.4.5.3 Ground Water Quality

The quality of the Burro Canyon perched ground water beneath and downgradient from the site is poor and extremely variable. Concentrations of TDS measured in water sampled from upgradient and downgradient wells range between 1,200 and 5,000 mg/L (IUC 2003). Split sampling by the State of Utah Division of Radiation Control in September 2002 indicated a TDS concentration in perched ground water ranging from 608 to 5,390 mg/L. Approximately 55 percent of the wells sampled had a TDS concentration of less than 3,000 mg/L. Consequently, these wells appear to intercept drinking-water-quality ground water under the Utah Ground Water Quality Protection Regulations (Class II ground water) (UAC 2003a). Sulfate concentrations measured in samples from three upgradient wells varied between 670 and 1,740 mg/L. The spatial variability of the ground water quality makes the definition of background water quality a challenge over the large extent of the millsite. This definition of background water quality is currently being refined. Ground water monitoring for the past 20 years at the site has shown no impact to perched ground water from the tailings cells (IUC 2003). However, during the May 1999 sampling event, the presence of chloroform and other man-made volatile organic compounds was detected in samples from the perched aquifer beneath the White Mesa Mill site. Subsequent aquifer characterization by IUC indicated that the chloroform plume was approximately 1,700 ft long and located across the eastern margin of the IUC facility. According to IUC, the chloroform was used in the laboratory of an earlier ore-buying station that operated at the site. The chloroform used for that operation was disposed of through a leach field.

Water quality from Ruin Spring (discharge from the perched ground water system), approximately 2.5 miles south-southwest of the mill, is generally good; TDS concentration is less than 1,000 mg/L (IUC 2003).

Ground water quality in the Entrada/Navajo aquifer is good; TDS content ranges from 216 to 1,110 mg/L (IUC 2003). Sampling of ground water in the Entrada/Navajo aquifer is not required under the mill's monitoring program because the aquifer is isolated from the perched ground water zone by approximately 1,000 ft of rock formations that have a low average vertical permeability.

3.4.5.4 Ground Water Use

Because of the generally low permeability of the perched ground water zone beneath the site, well yields are typically low (less than 0.5 gpm), although yields of about 2 gpm or greater may be possible in wells intercepting the higher permeability zones on the east side of the site (IUC 2003). Sufficient productivity can, in general, only be obtained in areas where the saturated thickness is greater, which is the primary reason that the perched ground water zone has been used on a limited basis as a water supply to the north (upgradient) of the site. The perched ground water is used primarily for stock watering and irrigation.

The Entrada/Navajo aquifer is capable of yielding domestic quality water at rates of 150 to 225 gpm and is used as a secondary source of potable water for the White Mesa Mill. Five deep water supply wells constructed by IUC at the White Mesa Mill facility (WW-1 through WW-5) are used for industrial and domestic needs. These wells are completed in the Entrada/Navajo aquifer. Also, two domestic water supply wells located 4.5 miles southeast of the millsite on the Ute Mountain Ute Indian Reservation draw water from this aquifer. Although the water quality and productivity of the Entrada/Navajo aquifer are generally good, the depth of the aquifer (approximately 1,200 ft below land surface) makes access difficult.

3.4.6 Surface Water

3.4.6.1 Surface Water Resources

No perennial surface water is present on the White Mesa Mill site. This lack of surface water results from the gentle slope of the mesa on which the site is located, the low average annual rainfall of 13.4 inches (measured at Blanding), local soil characteristics, and the porous bed material of local stream channels. The millsite is drained almost equally by Corral Creek on the east and by Westwater Creek and Cottonwood Wash on the west. White Mesa is defined by these two adjacent main drainages that have cut deeply into the regional sandstone formations. Storm water runoff in the local ephemeral streams is characterized by a rapid rise in flow rates followed by rapid recession, primarily because of the small storage capacity of the surface soils in the area. Monthly water flow is monitored on the larger drainage features (Cottonwood Wash, Recapture Creek, and Spring Creek); however, the smaller water courses closest to the millsite are not monitored because of their infrequent flows. Water flows through these drainages primarily during local heavy rainfall (occurring mostly during the months of August through October) and snowmelt (occurring mostly in April). Flow typically ceases in Corral and Westwater Creeks within 6 to 48 hours following significant storm events.

The U.S. Geological Survey (USGS) maintains two stream gages on watercourses in the region. One gaging station (No. 09378630) is located on Recapture Creek in the upper portion of the watershed at an elevation of 7,200 ft above mean sea level; the second gaging station (No. 098378700) is located on Cottonwood Wash approximately 7 miles southwest of Blanding at an elevation of 5,138 ft. Corral Creek has a drainage area of approximately 5.8 square miles adjacent to the site and is a tributary of Recapture Creek. Westwater Creek on the western edge of the site has a drainage area of nearly 27 square miles and is a tributary of Cottonwood Wash. Both Cottonwood Wash and Recapture Creek flow in a southerly direction and are tributaries of the major drainage artery of the region, the San Juan River. The San Juan River is a major tributary of the Colorado River and drains approximately 23,000 square miles above Bluff, Utah, which is located at the mouth of Cottonwood Wash. The San Juan River flows in a westerly direction toward its confluence with the Colorado River at Lake Powell, which is about 114 river miles west of Bluff. The major drainages in the vicinity of the White Mesa Mill site are summarized in Table 3–40. Total runoff from the site is estimated to be less than 0.5 inch annually.

Table 3–40. Drainage Basins Near the White Mesa Mill Site

Basin Description	Drainage Area (square miles)
Corral Creek at confluence with Recapture Creek	5.8
Westwater Creek at confluence with Cottonwood Wash	26.6
Cottonwood Wash at USGS gage west of millsite	<205
Cottonwood Wash at confluence with San Juan River	<332
Recapture Creek at USGS gage station	3.8
Recapture Creek at confluence with San Juan River	<200
San Juan River at USGS gage downstream at Bluff, Utah	<23,000

Source: *Description of the Affected Environment, White Mill Site, Blanding, Utah, for Transport by Slurry Pipeline and Disposal of the Moab Tailings* (IUC 2003)

Two small, ephemeral catch basins are located near the millsite; these ponds are filled by the mill to provide water and habitat for local wildlife. Springs and seeps at the edge of White Mesa are fed by the perched aquifer system and support wildlife and livestock in the area. These springs and seeps may constitute future points of exposure for mill tailings contaminants.

3.4.6.2 Surface Water Quality

Sampling of surface water quality in the mill vicinity began in July 1977 and continued through March 1978. Baseline data show conditions existing at the millsite and vicinity at that time. No samples were collected from the two catch basins at that time because they were dry. Sampling of ephemeral surface waters in the vicinity was possible only during major precipitation events; these streams are normally dry at other times.

Previous investigations (IUC 2003) concluded that surface water quality in the vicinity of the millsite is generally poor. Water samples collected from Westwater Creek were characterized as having high TDS (averaging 674 mg/L) and sulfate (averaging 117 mg/L). The waters were typically hard (total hardness measured as calcium carbonate averaged 223 mg/L) and had an average pH of 8.25; however, according to Utah ground-water classification and water-quality standards, TDS concentrations for a drinking water class II aquifer range from 500 to 3,000 mg/L. Estimated water velocities for Westwater Creek averaged 0.3 ft per second at the time of sampling. Samples from Cottonwood Creek were similar in quality to those from Westwater Creek, although TDS and sulfate levels were lower (TDS averaged 264 mg/L; sulfate averaged 40 mg/L) during heavy spring flow conditions (80 ft per second water velocity). During heavy runoff, the concentration of TDS in these streams increased to more than 1,500 mg/L. Concentrations of mercury and iron above background were measured in some samples. These values appear to reflect surface water quality in the area and are probably because of evaporative concentration and not because of human disturbance of the environment (NRC 1979).

In 1997, NRC prepared an environmental assessment (NRC 1997) to address renewal of the White Mesa Mill source material license (No. SUA-1358). NRC specified that surface water monitoring would be conducted at two sampling locations, Westwater Creek and Cottonwood Creek, adjacent to the mill. Grab samples were collected annually from Westwater Creek and quarterly from Cottonwood Creek.

These surface water samples were analyzed for TDS, total suspended solids, gross alpha, and total and dissolved concentrations of natural uranium, thorium-230, and radium-226. Field measurements included pH, specific conductivity, and temperature. Since the mill began operations in 1980, the measured values for these constituents have been consistently low.

Table 3–41 summarizes the results from monitoring conducted at Cottonwood Creek and Westwater Creek. In 2000 and 2002, Westwater Creek was dry, so no data are available for those years. Data from the mill's monitoring program indicate that concentrations of all analytes in samples collected from the Cottonwood and Westwater Creeks are within the range of background (NRC 1979).

3.4.6.3 Relevant Water Quality Standards

All ephemeral water bodies near the White Mesa Mill site area are tributaries of the San Juan River, which flows into the Colorado River; therefore, they are subject to the water quality classifications specified in Utah Administrative Code R317-2-13 (see Chapter 7.0).

3.4.7 Floodplains

Several streams exist near the White Mesa Mill site, but the site lies outside any potential floodplains. A more detailed description of these streams is available in Appendix F.

3.4.8 Wetlands

Topographic maps of the region potentially indicate 10 areas with riparian or wetland potential within the site boundary. Water resources in and near the White Mesa Mill site have not been assessed in detail, but several resources are known to exist. Appendix F includes more detailed descriptions and the locations of these known resources.

3.4.9 Terrestrial Ecology

This section describes the vegetation and wildlife, including protected and sensitive species, for the White Mesa Mill site. The region north of the millsite has the greatest diversity of vegetation compared to the other alternative sites. This diversity is primarily because of variation in life zones, elevations, and precipitation between the Moab site and the White Mesa Mill. However, sparsely vegetated desert-shrub communities dominate the immediate millsite area.

3.4.9.1 Terrestrial Vegetation and Wildlife

At the White Mesa Mill site, several areas were chained (i.e., trees and vegetation were removed) to support an active cattle ranch prior to mill operations. These areas were reseeded but are now mostly void of vegetation because of overgrazing, which has resulted in limited habitat. Current vegetation consists primarily of crested wheatgrass and invasive weeds. Surrounding areas of abandoned dry farms are dominated by annual weeds, rabbitbrush, snakeweed, sagebrush, and cheatgrass. Areas that were neither cultivated nor chained support sagebrush communities with a sparse understory of grasses, including galleta and crested wheatgrass. The potential vegetation consists of more than 50 percent palatable grasses such as western wheatgrass, Indian ricegrass, needle-and-thread, and squirreltail; 15 to 20 percent increaser grasses, including galleta and blue grama; 25 percent decreaser browse plants, including winterfat; and 5 to 10 percent big sagebrush, ephedra, and other shrubs. Forbs are rare.

On a visit to the site on January 29, 2003, the north and south sides of the entrance road to the White Mesa Mill were surveyed, and plant composition was documented. Three different areas similar to those described by the U.S. Department of Agriculture (USDA 1993) were observed. One area, northeast of the entrance road, is dominated by basin big sagebrush, which accounts for approximately 30 percent of the relative cover. The understory consists of galleta (20 to 30 percent), Indian ricegrass (5 percent), and cheatgrass (10 percent). Rubber rabbitbrush is growing along the disturbed soil next to the road. The area south of the entrance road is dominated by Wyoming big sagebrush (50 percent relative cover), and galleta and cheatgrass each account for approximately 10 percent of the relative cover. The northwest area of the entrance road has been previously seeded with crested wheatgrass (20 percent relative cover); rubber rabbitbrush (30 percent) is the dominant shrub. Other grasses include galleta (5 percent) and cheatgrass (5 percent). Table 3–42 shows the vegetation characteristics of the site, and Table 3–43 presents detailed vegetative structure at the site.

The millsite is somewhat comparable to the Moab site in terms of wildlife diversity and abundance. Pronghorn antelope, mule deer, and bobcat may occur in the vicinity of the site, depending upon habitat type. The red fox, gray fox, badger, longtail weasel, desert cottontail, and black jackrabbit are known to occur on the site.

Table 3–42. Vegetation Characteristics on the Various Soil Types at the White Mesa Site

Soil Name	Range Site	Characteristic Potential Vegetation	Percent	Productivity (pounds/acre)	Rooting Depth (inches)
Blanding very fine sandy loam, 2 to 10 percent slopes	Semidesert loam	Wyoming big sagebrush *(Artemisia tridentata* ssp. *wyomingensis)*	20	400–800	>60
		Indian ricegrass (*Achnatherum hymenoides)*	15		
		Galleta (*Pleuraphis jamesii)*	10		
		Bottlebrush squirreltail (*Elymus elymoides)*	10		
		Winterfat *(Ceratoides arborescens)*	10		
		Globemallow (*Sphaeralcea* spp.*)*	5		
		Needle-and-thread **(***Hesperostipa comata)*	5		
		Douglas rabbitbrush (*Chrysothamnous viscidiflorus)*	5		

Notes: USDA (1993)**,** Mellenthin soil type not found.
Source: NRCS 2002; SCS 1989.

Table 3–43. Community Structure Parameters of the White Mesa Mill Site Plant Communities

Community Group/Species		Relative Density	Percent Cover	Relative Cover	Relative Frequency
Reseeded Grassland I					
Grasses and grasslike plants					
	Crested wheatgrass (*Agropyron cristatum)*	92.0	12.0	78.2	66.4
	Sixweeks fescue (*Vulpia octoflora)*	1.0	0.1	0.5	5.6
	Galleta (*Pleuraphis jamesii)*	2.0	0.3	2.4	2.4
	Squirreltail (*Elymus elymoides)*	1.0	0.1	0.5	2.4
Forbs					
	Chicory *(Cichorium intybus)*	0.3	0.2	1.2	2.4
	Scarlet globemallow (*Sphaeralcea coccinea)*	0.3	0.1	0.5	2.4
Shrubs					
	Broom snakeweed (*Gutierrezia sarothrae)*	4.0	1.9	13.3	16.0
	Pale desert-thorn (*Lycium pallidum)*	0.3	0.5	3.6	2.4
Total vegetative cover			15.2		
Bare Ground Litter			61.0 24.2		
Reseeded Grassland II					
Grasses and grasslike plants					
	Crested wheatgrass (*Agropyron cristatum)*	96.0	8.9	82.7	75.0
Forbs					
	Russian thistle (*Salsola kali)*	0.6	0.1	1.2	5.0
	Scarlet globemallow (*Sphaeralcea coccinea)*	3.0	1.4	13.0	15.0
Shrubs					
	Broom snakeweed (*Gutierrezia sarothrae)*	0.6	0.3	3.1	5.0
Total vegetative cover			10.7		
Bare Ground Litter			79.7 9.5		
Controlled Big Sagebrush					
Grasses and grasslike plants					
	Crested wheatgrass (*Agropyron cristatum)*	19.0	3.4	19.3	15.0
	Galleta (*Pleuraphis jamesii)*	16.0	2.8	15.9	18.0
	Indian ricegrass (*Achnatherum hymenoides)*	3.0	0.5	3.0	2.0
	Squirreltail (*Elymus elymoides)*	10.0	1.7	9.8	24.0

Table 3-43. Community Structure Parameters of the White Mesa Mill Site Plant Communities (continued)

Community Group/Species		Relative Density	Percent Cover	Relative Cover	Relative Frequency
Forbs					
	Lesser rushy milkvetch (*Astragalus convallarius)*	3.0	0.5	3.0	5.0
	Russian thistle (*Salsola kali)*	11.0	1.9	11.2	15.0
	Scarlet globemallow (*Sphaeralcea coccinea)*	0.2	0.1	0.2	2.0
Shrubs					
	Big sagebrush (*Artemisia tridentata)*	27.0	4.7	27.0	7.0
	Broom snakeweed (*Gutierrezia sarothrae)*	10.0	1.8	10.4	12.0
Total vegetative cover			17.3		
	Bare Ground Litter		67.4 15.3		
Big Sagebrush					
Grasses and grasslike plants					
	Galleta (*Pleuraphis jamesii)*	72.8	12.7	38.1	35.9
	Squirreltail (*Elymus elymoides)*	19.0	1.1	3.3	23.4
Shrubs					
	Big sagebrush (*Artemisia tridentata)*	4.6	18.9	56.8	20.3
	Broom snakeweed (*Gutierrezia sarothrae)*	3.6	0.5	1.5	10.9
Total vegetative cover			33.3		
	Bare Ground Litter		49.9 16.9		
Pinon-Juniper					
Grasses and grasslike plants					
	Fendler threeawn (*Aristida purpurea)*	13.1	2.1	8.1	9.7
	Cheatgrass (*Bromus tectorum)*	1.2	0.1	0.4	4.8
	Galleta (*Pleuraphis jamesii)*	26.2	0.8	3.1	9.7
	Indian ricegrass (*Achnatherum hymenoides)*	1.2	0.6	2.3	1.6
	Squirreltail (*Elymus elymoides)*	4.8	0.1	0.4	3.2
	Cushion buckwheat (*Eriogonum ovalifolium)*	3.6	0.1	0.4	5.6
Forbs					
	Sand gilia (*Gilia leptomeria)*	8.3	0.04	0.1	1.6
	Stickseed (*Lappula occidentalis)*	1.2	2.4	9.3	1.6
Shrubs					
	Big sagebrush (*Artemisia tridentata)*	5.9	4.0	15.4	30.3
	Yellow rabbitbrush (*Chrysothamnous viscidiflorus* var *stenophyllus)*	1.2	0.3	1.1	5.6
	Mexican cliffrose (*Purshia mexicana)*	3.6	4.0	15.4	23.0
	Broom snakeweed (*Gutierrezia sarothrae)*	14.3	1.3	5.0	30.4
	Plains pricklypear (*Opuntia polyacantha)*	2.4	0.2	0.8	6.3
Trees					
	Utah juniper (*Juniperus osteosperma)*	4.8	7.2	27.8	37.6
	Pinon pine (*Pinus edulis)*	1.2	0.8	3.1	5.7
Lichen			1.0	3.9	29.5
Moss			0.8	3.1	6.3
Total vegetative cover			25.9		
Bare Ground Litter Rock			55.6 15.6 4.4		

Notes: Table from Dames and Moore (1978); indicates plant communities at time of survey.
Source: NRCS 2002; SCS 1989.

Seven species of amphibians are thought to occur in the area, but none are believed to inhabit the site. Up to 11 species of reptiles are believed to be in the vicinity of the millsite. No critical habitat exists in the millsite area.

3.4.9.2 Threatened and Endangered Species

This section describes federally listed terrestrial threatened and endangered, proposed, or candidate species that are or may be present in the White Mesa Mill site area. In March 2003, DOE requested an updated list of such species from USF&WS that may be present or affected by DOE's proposed alternatives. USF&WS responded in April 2003 with a list for San Juan County. Table 3–44 lists a subset of those species that may occur in the vicinity of the White Mesa Mill site.

Table 3–44. Federally Listed Threatened or Endangered Species Potentially Occurring in the Vicinity of the White Mesa Mill Site

Common Name	Scientific Name	Habitat Present and Affected	Species Present	Status	Comments
Navajo sedge	*Carex specuicola*	Possible	Possible	Threatened	
Southwestern willow flycatcher	*Empidonax traillii extimus*	Possible	Possible	Endangered	
Black-footed ferret	*Mustela nigripes*	No	No	Endangered	
Bald eagle	*Haliaeetus leucocephalus*	Possible	Possible	Threatened	Proposed for Delisting
Mexican spotted owl	*Strix occidentalis lucida*	Possible	Possible	Threatened	
Gunnison sage grouse	*Centrocercus minimus*	Possible	Possible	Candidate	

Spatial data for the species listed in Table 3–44 were obtained from the Utah Conservation Data Center (UCDC). This dataset was compiled by the Utah Natural Heritage Program (UNHP) of UDWR, in which species occurrences are depicted as points at a scale of 1:24,000 on 7.5-minute topographic quad maps. Spatial data depicting the White Mesa Mill site were overlaid on the species of concern spatial data to evaluate known species occurrences in the area.

The status of each of these species in the vicinity of the White Mesa Mill site is briefly discussed below. Appendix A1, "Biological Assessment," provides more detailed information concerning these federally listed species that may be in the vicinity of the White Mesa Mill site or could be affected by activities at the site.

All of the known populations of Navajo sedge in Utah are located at least 20 miles southwest of the White Mesa Mill site and associated borrow areas (UDWR 2003b). The Navajo sedge also is unlikely to occur at the White Mesa Mill site because the species requires wetland areas that do not occur within the area to be disturbed by development of the disposal cell.

There was a reported southwestern willow flycatcher sighting in San Juan County in the vicinity of the slurry pipeline corridor (UDWR 2003b). However, there is no information on the date of the reported sighting or on whether the sighting was confirmed. There is no suitable habitat for flycatchers known to occur on the White Mesa Mill site because wetland areas do not occur within the area to be disturbed by development of the disposal cell.

UDWR (2003b) reported a confirmed ferret sighting in the vicinity of the White Mesa Mill site 1937. However, all black-footed ferrets currently in the wild are believed to be the result of a federal reintroduction program. It is highly unlikely that the black-footed ferrets reintroduced in Uinta and Duchesne Counties in 1999 or their offspring could occur on or in the vicinity of the White Mesa Mill site. Black-footed ferrets depend almost exclusively on prairie dog colonies for food, shelter, and denning. Although the area from Moab south along US-191 toward the White Mesa Mill site supports colonies of Gunnison's prairie dog (*Cynomys gunnisoni*) (Seglund 2004), no colonies are currently known to occur at or close to the White Mesa Mill site.

The Utah Gap Analysis (UDWR 1999) indicates that potential high-quality bald eagle wintering habitat exists throughout many of the project areas, and they are known to frequent the area between Monticello and Blanding. However, bald eagles are not known to nest or night roost nor is it known to have been observed in the vicinity of the White Mesa Mill site.

Designated critical habitat for the Mexican spotted owl occurs within 2 miles of the transportation corridor just south (within 25 miles) of the Moab site. However, the southern tip of this section of critical habitat that lies within 2 miles of the transportation corridor is located at least 50 miles from the White Mesa Mill site. Further, data provided by UDWR (2003a) indicated that there were no occurrences of the Mexican spotted owl in any of the project areas. Thus, it is unlikely that spotted owls occur in the vicinity of the White Mesa Mill site.

Although the White Mesa Mill site is within a Gunnison sage grouse conservation area (Sage Grouse Working Group 2000), this species is not known to occur at the White Mesa Mill site (IUC 2003).

There is no designated or proposed critical habitat for any of the above federally protected species in the vicinity of the White Mesa Mill site.

On the White Mesa Mill site, there is no recorded presence of any threatened and endangered species (IUC 2003), including amphibians or reptiles (Dames and Moore 1978; UDWR 2003b).

3.4.9.3 Other Special Status Species

As previously discussed, special status species are those that are protected under federal and state regulations other than the ESA, which include the MBTA, Executive Order 13186, and Birds of Conservation Concern (USF&WS 2002f). The State of Utah and federal land management agencies maintain a list of species that they consider threatened, endangered, or sensitive or otherwise of concern. UDWR identified several species of state concern (UDWR 2003b), which included BLM- and USFS-identified species. However, only those listed by the USF&WS under the ESA are included in Section 7 consultations or in the Biological Assessment. Although the special status species are not covered by the ESA, USF&WS encourages protection of these species.

Table 3–45 lists plant species considered by state and federal resource agencies to be endangered, threatened, or otherwise of concern that may occur in the site region. A number of the species listed by the State of Utah or considered sensitive by BLM are potentially present in the vicinity of the White Mesa Mill site.

Table 3–46 includes animal species listed by the State of Utah as endangered, threatened, or otherwise of concern that may be present in the project region. The list includes all species identified by UDWR as potentially occurring in San Juan County; in some cases, the known population locations or suitable habitats may not be close to the site. The species listed as endangered or threatened by UDWR are discussed below.

Raptors are of primary concern, including the burrowing owl, golden eagle, red-tailed hawk, and osprey. The Raptor Protection Act requires that surveys be conducted before disturbances, depending upon season and proximity to nesting areas. Other birds of concern in the area include the long-billed curlew, loggerhead shrike, gray vireo, virginia's warbler, cassin's sparrow, and brewer's sparrow. Species previously described are not discussed in this section.

The long-billed curlew, although typically associated with aquatic environments, is also found in a variety of habitats, including plains, prairies, and open rangeland. In discussions with the BLM Monticello office, it was discovered that this species is commonly found in habitats frequented by burrowing owls in the vicinity of the White Mesa Mill site. The loggerhead shrike is typically found in open country, low scrub, and desert environments characteristic of the northern and southernmost segments of the transportation corridor. The gray vireo and virginia's warbler are commonly found in the foothills zone characterized by piñon-juniper forest, scrub oak, and open chaparral. The cassin's and brewer's sparrows are found in habitat characterized by low brush (e.g., sagebrush) and arid to semiarid regions.

Table 3–47 lists bird species, including migratory birds, that may occur in the vicinity of the site, although on-site habitat limits typical nesting and breeding activities. Most of these species are protected under the MBTA, which prohibits take or destruction of birds, nests, or eggs of listed migratory birds.

3.4.10 Land Use

Of the more than 4.9 million acres in San Juan County, approximately 60 percent of the land is administered by federal agencies. There are several national parks in the county. The entire western boundary of the county is adjacent to Canyonlands National Park, Glen Canyon National Recreation Area, the Colorado and Green Rivers, and Lake Powell. Approximately 28 miles due west of the White Mesa Mill site is Natural Bridges National Monument. Hovenweep National Monument is about 25 miles to the east-southeast. San Juan County has a total of 15 national, state, and tribal parks and recreation areas. Most of these resources are within a 50-mile radius of the site, but none are in the immediate vicinity of the site.

Approximately 30 percent of San Juan County lands are in Indian reservations. The White Mesa Ute Indian Reservation totals more than 8,300 acres and is located 3.4 miles south of the site along both sides of US-191. Several small, isolated, and uninhabited Ute Reservation parcels are west of Blanding. The Navajo Reservation occupies the entire southern portion of the county and constitutes 28 percent of county lands.

Much of the land in San Juan County is public domain and open to recreational use. Tourism is increasingly becoming the mainstay of the local economy. Favorable weather allows off-road access for hikers, bikers, and off-highway vehicles in virtually all seasons. The Colorado River, which runs along the western border of the county, is a source of extensive recreational use for summer water sports. BLM administers most of the federal lands and makes the lands available for grazing, oil and gas leasing, and mining claims. As late as 1977, San Juan County was the largest processor of uranium ore in Utah. The Aneth Oil Field in southern Utah is the second largest field in Utah and is still producing. While oil production has been steadily declining, natural gas production is expanding. The USFS lands are also available for multiple uses such as recreational, agricultural, and timber and mining production.

Table 3–47. Sensitive Bird Species Protected Under the Fish and Wildlife Conservation Act and Migratory Bird Treaty Act That May Occur Near the White Mesa Mill Site

Species	Potential to Occur in Project Area
Order Falconiformes—Birds of prey	
Golden eagle *(Aquila chrysaetos)*	High
Northern harrier *(Circus cyaneous)*	Moderate
Prairie falcon *(Falco mexicanus)*	Moderate
Red-tailed hawk (*Buteo jamaicensis*)	High
Turkey vulture (*Cathartes aura)*	High
Order Gruiformes—Marsh and open country birds	
Black rail *(Laterallus jamaicensis)*	Moderate
Yellow rail *(Coturnicops noveboracensis)*	Low
Order Strigiformes—Nocturnal birds of prey	
Barn owl *(Tyto alba)*	Low
Flammulated owl *(Otus flammeolus)*	Low
Short-eared owl *(Asio flammeus)*	Low
Order Apodiformes—Small swallowlike birds	
Black swift *(Cypseloides niger)*	Low
Vaux's swift *(Chaetura vauxi)*	Low
Order Piciformes—Wood-boring birds	
Red-headed woodpecker *(Melanerpes erythrocephalus)*	Low
Williamson's sapsucker *(Sphyrapicus thyroideus)*	Low
Order Passeriformes—Perching birds	
Olive-sided flycatcher *(Contopus borealis)*	Low
Gray flycatcher *(Empidonax wrightii)*	Moderate
Pinyon jay *(Gymnorhinus cyaneocephalus)*	Low
Bendire's thrasher *(Toxostoma bendirei)*	High
Crissal thrasher *(Toxostoma dorsale)*	High
Bewick's wren *(Thryomanes bewickii)*	Moderate
Sedge wren *(Cistothorus platensis)*	Low
Verry *(Catharus fuscenscens)*	Moderate
Sprague's pipit *(Anthus spragueii)*	Low
Loggerhead shrike *(Lanius ludovicianus)*	Moderate
Gray vireo *(Vireo vicinior)*	Moderate
Virginia's warbler *(Vermivora virginiae)*	Moderate
Black-throated warbler *(Dendroica nigrescens)*	Low
Grace's warbler *(Dendroica graciae)*	Low
Blackpoll warbler *(Dendroica striata)*	Low
Dickcissell *(Spiza americana)*	Low
Sage sparrow *(Amphispiza belli)*	Low
Cassin's sparrow *(Aimophila cassinii)*	Low
Brewer's sparrow (*Spizella breweri)*	Moderate
Lark bunting *(Calamospiza melanocorys)*	High
Baird's sparrow *(Ammodramus bairdii)*	Low
Grasshopper sparrow *(Ammodramus savannarum)*	Low
McCown's longspur *(Calcarius mccownii)*	Low
Chestnut-collared longspur *(Calcarius ornatus)*	Low

Note: Birds listed in the table are protected under the Fish and Wildlife Conservation Act (Birds of Conservation Concern [2000] [USF&WS 2002f] and the MBTA [50 CFR 10], Executive Order 13186). Species listed as threatened or endangered under the ESA or considered endangered, threatened, or rare by the State of Utah are not included here.

Private land in San Juan County is dedicated almost entirely to agriculture. The areas most amenable to farming are in the east-central portion of the county. The principal crops are wheat and beans. There are no prime or unique farmlands in San Juan County. The arid climate, lack of irrigation, and the rugged landforms dictate grazing as the primary agricultural use. However, low rainfall and lack of sufficient vegetation limit livestock numbers. Except where irrigation is present, livestock herds are widely spaced, and federal grazing allotments cover large areas.

In the past, dry farming has been largely unsuccessful on soil types characteristic of this area. However, the Blanding soils are deep and easy to plow, have high moisture-holding capacity, and are high in inherent fertility if irrigated.

The White Mesa Mill site is a 5,415-acre parcel that is privately owned by IUC. Land use in the vicinity of the site and directly outside the property boundary is zoned agricultural by San Juan County. Land within 5 miles of the site is privately owned agricultural land. A parcel of land comprising the site is a six-section area that is zoned as an industrial controlled district. Blanding is expanding its commercial district to the south along US-191 in the direction of the site. It is currently 4.7 miles from the northern edge of the site to the southern expansion of Blanding development. A National Guard Armory is 3.7 miles north of the site.

The largest communities in San Juan County are Monticello and Blanding. Very few residents live near the site. The nearest full-time residence is a farm/ranch located 1.6 miles north of the site. A residence associated with a convenience store and gas station is located at the intersection of US-191 and SR-95 approximately 3 miles north of the site. In addition, there is a residence at the Blanding airport about 3.5 miles north of the site. The Ute Mountain Reservation is 3.4 miles south of the site, and the community of White Mesa is approximately 5 miles to the south. Figure 3–38 presents a land use map of the White Mesa Mill site area.

Ongoing consultations with White Mesa Mill elders have identified burial sites near the White Mesa Mill site entrance.

3.4.11 Cultural Resources

The cultural history of the White Mesa Mill site area is discussed in the more general cultural history of southeastern Utah described in Section 3.1.13.1; the Class I cultural resource inventory that was conducted for the White Mesa Mill site is described in Section 3.1.13.2.

Results of the Class I inventory (Davis et al. 2003) indicate that a number of Class III cultural resource surveys have been conducted at the White Mesa Mill site, primarily between 1976 and 1981. The areas of the White Mesa Mill site encompassed by the Class I inventory include Sections 28, 29, 32, and 33 of T. 37 S., R. 22 E. and Sections 4 and 5 and the north half of Section 9 of T. 38 S., R. 22 E. Within this area, the Class I inventory documented 231 cultural sites. Of these 231 sites, 196 (85 percent) have been determined eligible for inclusion in the National Register of Historic Places. Table 3–48 summarizes the types of sites documented for each section.

The probable time periods represented by the 231 sites are summarized, by section, in Table 3–49. Most of the sites are associated with Anasazi habitation between A.D. 450 and A.D. 1150. From an initial low frequency of Archaic and Basketmaker II sites (see Table 3–49 footnotes), there is a pronounced increase in Basketmaker III sites, followed by a steady increase in sites through the Pueblo I and Pueblo II periods. The population of prehistoric inhabitants appears to have peaked during early Pueblo II and remained fairly stable into the early Pueblo III period, after which it declined sharply. In contrast to the high number of prehistoric sites, only seven sites are attributed to the historic period. Of this total, one is a Navajo camp and one is a Ute camp; the other five lacked diagnostic artifacts or other attributes to determine cultural affiliation.

Table 3–48. White Mesa Mill Site—Summary of Cultural Sites by Type

Section	Habitation Site	Temporary Habitation Site	Limited Activity Site	Granary	Quarry	Unknown	Total	NRHP Eligible Yes/No
Sec. 28	17		11				28	21/7
Sec. 29	7	2	3	6		2	20	18/2
Sec. 32	15	2	12		2	7	38	31/7
Sec. 33	22		13			1	36	21/15
Sec. 4	38		5				43	43/0
Sec. 5	32	4	11				47	45/2
Sec. 9, N1/2	12	2	5				19	17/2
Total	143 (62%)	10 (4%)	60 (26%)	6 (3%)	2 (1%)	10 (4%)	231	196/35 (85%/15%)

NRHP = National Register of Historic Places

Within the 6.5-section area encompassed by the Class I inventory, a notable site distribution pattern—from northeast to southwest—is present. The more northerly Sections 28 and 29 average 24 sites per square mile; the middle Sections 32 and 33 average 37 sites per square mile; and the southerly Sections 4 and 5 average 45 sites per square mile. This increasing site density from northeast to southwest is likely a function of specific environmental factors—mainly, nearness to a water source. The more southerly sites are closer to the canyon edges where the water sources are located.

Recent interviews (Fritz 2004, in progress) with tribal members indicate that at least five potential traditional cultural properties associated with the White Mesa Ute Tribe exist on or near the White Mesa Mill site. These are "potential" traditional cultural properties because their eligibility for National Register status has yet to be determined; this determination would be made during the Section 106 consultation process. Interviews conducted with tribal members before the current mill was constructed indicate that sacred areas existed within the IUC site boundaries at that time as well (Fritz 2004, in progress). In the White Mesa Mill area, the likelihood of occurrence of traditional cultural properties and their estimated density are extremely high (on a scale of low-medium-high-extremely high) and are likely associated with the Ute Tribe, Navajo Nation, and Hopi Tribe (Fritz 2004, in progress). Traditional cultural properties in this area may include sacred gathering areas, sacred healing areas, sacred springs, and burial areas.

3.4.12 Noise and Vibration

The White Mesa Mill site is within the boundaries of the IUC site. Background noise levels are expected to be comparable to noise levels associated with open desert areas, with some influence from the existing IUC operation. These noise levels could approach 50 to 60 dBA at the White Mesa Mill site area as a result of operations at the IUC mill. US-191 passes about 1 mile to the east of the White Mesa Mill site area and does not significantly contribute to background noise (less than 50 dBA).

Neither background noise nor ground vibration data are available for the White Mesa Mill site. No residences are in the surrounding areas, although the land adjacent to IUC property may be used for outdoor recreation.

3.4.13 Visual Resources

The White Mesa Mill site is located immediately west of US-191 in a rural area approximately 5 miles south of the town of Blanding and 5 miles north of the community of White Mesa. Gently rolling rangelands dotted with sagebrush, piñon-pine, and juniper surround this commercial facility. Most of the facility consists of several large metal structures, a yellow-brick office building, and numerous earthen piles. The taller structures and piles are visible from US-191 but do not dominate the view because of their distance (approximately 0.5 mile) from the highway. The existing disposal cells are not visible from the highway (Figure 3–39).

Figure 3–39. View of the White Mesa Mill Site from the Entrance Road on US-191

Approximately 1.6 miles north of the facility is the nearest residence, from which the taller facility structures are barely visible. The areas proposed to be disturbed by the new disposal cells are not visible from US-191 or from the nearest residence. BLM places the area surrounding the facility in the Class III visual resources category (Sweeten 2003). Section 3.1.15 describes the visual resource classes.

3.4.14 Infrastructure

3.4.14.1 Waste Management

Mill-generated sewage is disposed of in an on-site state-approved leach field system. This system manages sanitary wastes generated by the 70 to 100 full-time workers that are typically employed when the mill is in production mode; the maximum capacity of the system is unknown. Mill-generated solid waste is disposed of in the on-site tailings cells.

3.4.14.2 Electric Power Supplies

An existing three-phase overhead power line runs adjacent to US-191; an existing substation that supplies the White Mesa Mill site is approximately 0.25 mile from the site. The existing power line ends approximately 4 miles north of where the booster pump station would be located.

3.4.14.3 Water Supplies

Potable and nonpotable water needs at the White Mesa Mill site are supplied from existing deep wells and the Recapture Reservoir, respectively. The Entrada/Navajo aquifer is capable of yielding domestic quality water at rates of 150 to 225 gpm (216,000 to 324,000 gallons per day) and is used as a secondary source of potable water for the White Mesa Mill site. There are five deep water supply wells constructed by IUC at the White Mesa facility.

3.4.15 Transportation

Table 3–15 in Section 3.1.17 describes AADT, congestion, truck percent, and accident rates on US-191 between Moab and Blanding. US-191 south of Moab is generally not congested; it carries AADT volumes that vary from 2,861 at the junction of US-191 and the White Mesa Mill site to 7,450 at the south Blanding city limits. At the San Juan County/Grand County line, traffic increases to an AADT of 8,510. The road is two-lane until it reaches downtown Moab. Two road segments are noted as having actual accident rates that exceed the expected accident rate; other reported segments are considered not congested and have low accident rates. The two segments that have high accident rates occur at the junction of US-191 and US-491 (formerly US-666) in Monticello, and at the junction of US-191 and SR-95 south of Blanding (see Figure 3–40).

Although road congestion and accident rates are considered low, south of Moab, US-191 follows rolling hills with often poor sight lines around curves.

No rail transportation is available between the Moab site and the White Mesa Mill site.

3.4.16 Socioeconomics

3.4.16.1 Demography of the Area

The 2000 census reported the population density of San Juan County as 1.8 individuals per square mile. By comparison, the statewide density is greater than 27.2 persons per square mile.

Blanding, approximately 5 miles north of the mill, is the largest population center near the millsite and had a 2000 census population of 3,162. Approximately 5 miles southeast of the White Mesa Mill site is the White Mesa community of approximately 277 Ute Mountain Ute tribal members. An estimated 60 to 75 individuals live within 5 miles of the site (IUC 2003) (Figure 3–41). The nearest resident to the millsite is approximately 1.6 miles north of the mill.

The Navajo Reservation is approximately 19 miles southeast of the mill. The nearest community on the Navajo Reservation is Montezuma Creek, with a population of about 507. Figure 3–41 provides population centers located within 50 miles of the millsite.

3.4.16.2 Socioeconomic Profiles

San Juan County is the largest and poorest county in Utah. As of October 2002, the unemployment rate in the county was 7.8 percent, compared to 5.2 percent in the state of Utah, and 5.6 percent for the nation. When operating, the White Mesa Mill is the largest private employer in San Juan County, employing 70 to 100 full-time workers. Typically, the mill employs a high percentage of minority workers. During the mill operation that began in June 2002, mill employment ranged from 45 to 75 percent Native Americans.

Since its inception in 1980, the mill has run on a campaign basis, in each case remaining on standby pending accumulation of sufficient ore stockpiles to justify a milling campaign. Currently, mill employees are predominantly residents of San Juan County or residents of neighboring counties who commute to the mill daily. Historically, the mill has drawn from residents of San Juan County and neighboring counties for each milling campaign, rather than relying upon an influx of workers to the area.

3.4.17 Human Health

Nationwide, on average, people are exposed to approximately 300 mrem/yr from natural background radiation (NCRP 1987). Table 3–50 summarizes the radiation doses from natural background, assuming residential exposure is occurring at the White Mesa Mill site.

Table 3–50. United States and the White Mesa Mill Site Natural Background Radiation Doses

Source	U.S. Average Natural Background Radiation Dose (millirem/yr)	White Mesa Mill Natural Background Radiation Dose (millirem/yr)
Cosmic and cosmogenic radioactivity	28	68
Terrestrial radioactivity	28	74
Internal radioactivity	40	40
Inhaled radioactivity	200	260
Rounded Total	300	440

The largest natural source is inhaled radioactivity, mostly from radon-222 and its radioactive decay products in homes and buildings, which accounts for about 200 mrem/yr. Additional natural sources include radioactive material in the earth (primarily external radiation from the uranium and thorium decay series), radioactive material in the body (primarily potassium-40), and cosmic rays from space filtered by the atmosphere.

The actual radiation dose from natural background radiation varies with location. On the basis of data for Blanding, the radiation dose from cosmic and cosmogenic radioactivity would be about 69 mrem/yr at the White Mesa Mill site, the radiation dose from external terrestrial radioactivity would be about 74 mrem/yr, and the radiation dose from radon-222 and its radioactive decay products would be about 260 mrem/yr (IUC 2003). The total natural background radiation dose at the White Mesa Mill site would be about 440 mrem/yr, considerably higher than the national average.

According to the 2000 census, the population within 50 miles of the White Mesa Mill site was about 21,800 (Figure 3–41). Assuming that all residents were exposed to 440 mrem/yr, the population dose would be about 9,600 person-rem per year.

Existing Operations at the White Mesa Mill

The individual radiation dose for members of the public from existing operations at the White Mesa Mill was estimated to be 10 mrem per year (IUC 2003). The population dose to the 50-mile population surrounding the White Mesa Mill site was estimated to be 4 person-rem per year (IUC 2003).

For workers at the White Mesa Mill, the average individual radiation dose was 0.11 rem in 1999. The population dose to these workers was 10 person-rem.

3.4.18 Environmental Justice

Section 3.1.20 describes the legal basis for evaluating environmental justice and general census characteristics in San Juan County. Figure 3–42 and Figure 3–43 provide the minority population distribution within 50 miles of the site and income by household, respectively. The Navajo Reservation occupies a significant portion (28 percent) of San Juan County. Figure 3–42 shows greater than 50 percent of the total population as minority occurring within 20 miles of the White Mesa Mill site. The Ute Mountain Reservation is adjacent to the White Mesa Mill site. Reported household incomes of less than $18,244 per year (poverty level for a family of four) are found in census group blocks within about one-half of the minority-populated areas south of the site.

The closest low-income block group is about 15 miles from the site. Areas west of US-191 that are considered to have greater than 50 percent minority population had reported incomes between $18,244 and $41,994.

3.4.19 Pipeline Corridor

3.4.19.1 Geology

This section describes the level of seismic risk, possibility for subsidence, landslide potential, and occurrence of expansive clay evaluated from a geologic perspective for the proposed pipeline route from the Moab site to the White Mesa Mill site.

Seismicity (and seismic risk) is low in this part of the central Paradox Basin, and has a low rate of occurrence with small- to moderate-magnitude earthquakes (Wong and Humphrey 1989). The pipeline route is in Uniform Building Code 1, indicating lowest potential for earthquake damage (Olig 1991).

Quaternary displacement is evident along the Shay Graben Faults (Wong and Humphrey 1989), and small earthquakes have possibly been associated with these faults (Wong et al. 1996), the eastern ends of which cross the pipeline route about 3 miles south of Church Rock. The similar east-striking Verdure Graben Fault system may also have had Quaternary displacement; the proposed pipeline corridor would cross this fault system about 5 to 6 miles south of Monticello.

Geologic conditions for subsidence and landslides were evaluated in the EIS for the Queston, Williams, and Kern River pipeline route (DOI 2001), which closely follows the proposed pipeline corridor from the Moab site to White Mesa Mill site south to near Wilson Arch. In that EIS, no risks for landslides, soil liquefaction, or collapsible soils were noted for the shared areas of these pipelines. Farther south on the proposed pipeline corridor, landslides are present in the Brushy Basin Member of the Morrison Formation on the north slope of the Sage Plain about 4 to 6 miles south of Church Rock (Harty 1991). Also, landslides occur in the Brushy Basin Member in the Recapture Wash area along the proposed pipeline (Harty 1991, 1993).

Expansive clay (montmorillonite), which can potentially cause engineering geologic problems when a change in water content causes shrinking and swelling, occurs in mudstones of the Brushy Basin Member of the Morrison Formation. The two main areas along the proposed pipeline corridor on this member, as noted by Mulvey (1992), are the Recapture Wash area and the area between Spanish Valley and Kane Springs.

3.4.19.2 Soils

For the purpose of soils discussion, this proposed pipeline corridor can be divided into two segments: Moab site to Peters Canyon, approximately 9 miles north of the city of Monticello (Maps 5 through 11, Appendix C), and Peters Canyon to the White Mesa Mill site (Maps 12 through 16, Appendix C). Peters Canyon marks a physiographic boundary between the lower-elevation canyon country of northern San Juan County and the rolling tableland of central San Juan County known as the Sage Plain. The head of Peters Canyon also marks a boundary between soils formed in semiarid and in subhumid climates (USDA 1962).

Four general soil map units or soil associations occur between the Moab and Peters Canyon segment of the pipeline corridor: Thoroughfare-Sheppard-Nakai, Begay-Moab-Redbank, Rizno Dry-Rock Outcrop, and Ustic Torriorthent-Ustic Calciorthids-Ustollic Haplargids (USDA 1991). The segment of the proposed pipeline corridor from Peters Canyon to the White Mesa Mill site crosses five general soil map units or soil associations in the higher, subhumid region of the Sage Plain, then drops into semiarid upland soil map units just south of the town of Blanding. The San Juan Area Soil Survey (USDA 1962) groups the soil series and soil map units as range sites based on land use and management. The soil types and potential natural vegetation for both of these pipeline corridor segments are described in the SOWP (DOE 2003).

3.4.19.3 Ground Water

Depth to ground water varies widely between Moab and the White Mesa Mill site. For the first 2 to 3 miles of the pipeline corridor southeast from the Moab site, ground water is shallow (within a few feet of the ground surface) in the Matheson Wetlands Preserve area of the Moab Valley. For the next approximately 10 miles, the pipeline corridor runs along the southwest flank of Spanish Valley in Quaternary alluvial fill and fan material, in which the depth to ground water is generally between 50 and 100 ft. In the approximately 3 miles between Spanish Valley and Kane Springs, the pipeline corridor crosses a higher elevation area that is underlain by the Salt Wash Member of the Morrison Formation, where depth to ground water is less than 100 ft. Except for a small area where shallow ground water is present in alluvium around the Hatch Wash crossing, ground water from Kane Springs south to about 2 miles south of Church Rock is in Entrada, Navajo, and Wingate Sandstones. As the pipeline corridor climbs southward up to the Sage Plain, ground water is in the Burro Canyon Formation and Dakota Sandstone. Ground water on the Sage Plain, which extends south generally to Recapture Wash and in alluvium where the pipeline corridor crosses Verdure Creek and Devil Canyon, is less than 50 ft deep. From the shallow alluvial water at Recapture Wash south to the White Mesa Mill site, the pipeline corridor is underlain by shallow (less than 50 ft deep), perched ground water in alluvial Quaternary terrace gravels and ground water in the immediately underlying bedrock (Gloyn et al. 1995).

3.4.19.4 Surface Water

The perennial waters that this pipeline corridor would either cross or affect include the Colorado River, Matheson Wetlands Preserve, Mill Creek, Pack Creek, Kane Springs Creek, Vega Creek, Montezuma Creek, Verdure Creek, Devil Canyon, Long Canyon, and Recapture Creek (these are shown on the segment reference maps in Appendix C).

The ephemeral/intermittent drainages that this pipeline corridor would either cross or affect are Muleshoe Canyon, West Coyote Creek, Joe Wilson Canyon, Hook and Ladder Gulch, Hatch Wash, Lightning Draw, Big Indian Wash, Sandstone Draw, Tank Wash, East Canyon, Peter's Canyon, South Canyon, Spring Creek, Halfway Hollow, Bull Hollow, Dodge Canyon, Whipstock Draw, Bullpup Canyon, Lem's Draw, Brown Canyon, and Corral Canyon. Numerous other smaller, unnamed drainages, all of which are intermittent, would also be affected (see the segment reference maps in Appendix C).

<u>Water Quality and Existing Surface Water Contamination</u>

None of the perennial water resources within the pipeline corridor are listed as "High Quality Waters" as defined by UDEQ regulations (UAC 2003b). However, water quality varies widely among many of the perennial surface-water resources identified within this pipeline corridor. As the pipeline corridor passes through higher elevations near the Verdure and Devil Canyon drainages south of Monticello, the water quality in these streams is higher than that observed in perennial water sources at lower elevations (e.g., the Colorado River at Moab, Recapture Creek at Blanding).

The seasonal washes located within this pipeline corridor are dry most of the year, and no water quality data are available. Flow occurs in these washes primarily after significant storm events. When storm water does flow through these washes, it is laden with sediments, and water quality is anticipated to be poor. Many of these ephemeral washes collect surface water runoff primarily from areas of Mancos Shale. Soils associated with the Mancos Shale are alkaline and may have high concentrations of selenium. As a result, surface water quality from these drainage features would likely be characterized as having high salinity, turbidity, hardness, and elevated levels of sulfate and selenium.

<u>Relevant Water Quality Standards</u>

All surface water bodies (both perennial and ephemeral) in this pipeline corridor are eventually tributaries to the Colorado River; therefore, they are subject to the water quality classifications specified in Utah Administrative Code R317-2-13 (see Chapter 7.0).

3.4.19.5 Floodplains and Wetlands

The White Mesa Mill pipeline would cross 11 perennial streams containing riparian vegetation and at least 21 intermittent drainages. The pipeline would also cross the Colorado River and the Matheson Wetlands Preserve. There have been previous utility crossings in the preserve, and the pipeline would follow these as closely as possible. Appendix F provides additional details relevant to the pipeline crossing.

3.4.19.6 Terrestrial Ecology

Section 3.4.9 describes the affected environment for terrestrial ecology for the White Mesa Mill site. This section addresses only the areas, wildlife, and habitat that may be affected by the proposed pipeline corridor (Maps 4 through 16, Appendix C). This transportation corridor is likely to support a greater diversity and abundance of vegetation and wildlife than the other pipeline routes. For example, the region near Monticello, north of the White Mesa Mill site, is dominated by the foothills life zone (transition zone), which ranges from 6,000 to 9,000 ft in elevation. Piñon-juniper forests and scattered ponderosa pine stands dominate this zone. General vegetation and wildlife information applicable to the regional descriptions as described in Section 3.4.9 is not repeated in this section.

Pronghorn antelope, mule deer, and bobcat occur along the proposed pipeline corridor and in the vicinity of the site, depending upon habitat type. The red fox, gray fox, badger, longtail weasel, desert cottontail, and black jackrabbit are known to occur along the southernmost segments of the corridor. Sagebrush communities along the route are home to many other species of small mammals, birds, and reptiles. Smaller mammals inhabiting the piñon-juniper woodland include raccoons, skunks, badgers, coyotes, woodrats, and deer mice. Bird species, including piñon jays and several species of raptors, also use the piñon-juniper habitat. Up to seven species of amphibians are thought to occur in riparian and wetland areas that may be within the pipeline corridor.

Critical habitat exists for several nonsensitive mammals and bird species along this segment of the pipeline corridor. The area that includes T. 30 S., R. 23 E. (Map 9, Appendix C) has been designated as critical habitat for the pronghorn antelope during fawning, and restrictions are in effect between May 15 and June 15 each year. Mule deer migration routes have been identified in T. 33 S. – T. 35 S., ranges to the east and west (Maps 11 through 14, Appendix C). Critical winter range is located in T. 35 S.–T. 37 S., (Maps 14 through 16, Appendix C) east of US-191, where restrictions are in effect from November 15 to April 30 each year.

The loggerhead shrike (*Lanius ludovicianus*) is typically found in open country, low scrub, and desert environments characteristic of the southernmost segments of the pipeline corridor. The gray vireo (*Vireo vicinior*) and virginia's warbler (*Vermivora virginiae*) may also exist in this area because they are commonly found in the foothills zone characterized by piñon-juniper forest, scrub oak, and open chaparral.

In March 2003, DOE requested an updated list of federally terrestrial threatened and endangered, proposed, or candidate species from USF&WS that may be present or affected by DOE's proposed alternatives. USF&WS responded in April 2003 with a list for San Juan County. Appendix A1, "Biological Assessment," provides more detailed information concerning these species. Table 3–51 lists a subset of those species that may occur in the vicinity of the pipeline corridor between the White Mesa Mill site and the Moab site.

Table 3–51. Federally Listed Threatened and Endangered Species Potentially Occurring in the Vicinity of the Proposed Pipeline Corridor

Common Name	Scientific Name	Habitat Present and Affected	Species Present	Status	Comments
Navajo sedge	*Carex specuicola*	Possible	Possible	Threatened	
Southwestern willow flycatcher	*Empidonax traillii extimus*	Possible	Possible	Endangered	
Black-footed ferret	*Mustela nigripes*	No	No	Endangered	
Yellow-billed cuckoo	*Coccyzus americanus*	No	No	Candidate	
Bald eagle	*Haliaeetus leucocephalus*	Possible	Possible	Threatened	Proposed for Delisting
Mexican spotted owl	*Strix occidentalis lucida*	Possible	Possible	Threatened	
Gunnison sage grouse	*Centrocercus minimus*	Possible	Possible	Candidate	

All of the known populations of Navajo sedge in Utah are located at least 20 miles southwest of the White Mesa Mill site and associated borrow areas (UDWR 2003b). However, because the Navajo sedge requires wetland areas, it could potentially occur within the pipeline corridor where it crosses seeps and springs.

There was a reported southwestern willow flycatcher sighting in San Juan County in the vicinity of the slurry pipeline corridor (UDWR 2003b). However, there is no information on the date of the reported sighting or on whether the sighting was confirmed. Flycatchers could potentially occur along wetland areas of the pipeline corridor. It is currently unknown whether or not these wetland areas constitute suitable nesting habitat and/or whether they could be used as stopover habitat during migration.

Like the southwestern willow flycatcher, the Western yellow-billed cuckoo is also a riparian obligate. However, the cuckoo most likely does not occur along wetland areas of the pipeline corridor because associated areas of riparian vegetation are likely to be much smaller than that required by the cuckoo for nesting (100 to 200 acres of contiguous large gallery-forming or developing trees).

UDWR (2003b) reported a confirmed ferret sighting in the vicinity of the White Mesa Mill site 1937. However, all black-footed ferrets currently in the wild are believed to be the result of a federal reintroduction program. It is highly unlikely that the black-footed ferrets reintroduced in Uinta and Duchesne Counties in 1999 or their offspring could occur in the vicinity of the pipeline between the White Mesa Mill site and the Moab site. However, black-footed ferrets depend almost exclusively on prairie dog colonies for food, shelter, and denning. The area from Moab south along US-191 toward the White Mesa Mill site supports colonies of Gunnison’s prairie dog (Seglund 2004). It is unknown to what extent individual colonies or a combination of these colonies could support black-footed ferrets.

The Utah Gap Analysis (UDWR 1999) indicates that potential high-quality bald eagle wintering habitat exists throughout many of the project areas, and bald eagles are common between Monticello and Blanding (Maps 12 through 14, Appendix C) during winter months. However, bald eagles are not currently known to night roost (or nest) near the route proposed for the pipeline corridor between the White Mesa Mill site and the Moab site.

Designated critical habitat for the Mexican spotted owl occurs within 2 miles of the pipeline corridor just south (within 25 miles) of the Moab site. Data provided by UDWR (2003a) indicated that there were no occurrences of the Mexican spotted owl in any of the project areas. However, based on proximity to critical habitat, spotted owls could potentially occur within 2 miles of the pipeline corridor just south (within 25 miles) of the Moab site.

The pipeline corridor between the White Mesa Mill site and the Moab site is within a Gunnison sage grouse conservation area (Sage Grouse Working Group 2000). High quality habitat for the Gunnison sage grouse has been designated in T. 31 S.–T. 33 S., R. 24 E. (Maps 10 and 11, Appendix C).

Besides that noted above for the Mexican spotted owl, there is no designated or proposed critical habitat for any of the other federally protected species in the vicinity of the pipeline corridor between the White Mesa Mill site and the Moab site.

No threatened or endangered amphibians or reptiles are believed to be present within the area of the pipeline corridor (Dames and Moore 1978; UDWR 2003b).

DOE, in consultation with USF&WS and BLM, would determine the need for additional habitat evaluations and surveys for species that could be affected by the proposed action should this alternative be selected.

As previously discussed, special status species are those that are protected under federal and state regulations other than the ESA, which include the MBTA, Executive Order 13186, and Birds of Conservation Concern (USF&WS 2002f). The State of Utah and federal land management agencies maintain a list of species that they consider threatened, endangered, or sensitive or otherwise of concern. By letter dated May 30, 2003, UDWR identified several species of state concern, which included BLM- and USFS-identified species. However only those listed by USF&WS under the ESA are included in Section 7 consultations or in the Biological Assessment. Although the special status species are not covered by the ESA, the State of Utah, BLM, USFS, and USF&WS encourage protection of these species.

Table 3–52 lists sensitive plant species considered by state and federal resource management agencies to be of concern that may occur in the vicinity of the pipeline corridor. A number of the species listed are potentially present in the vicinity of the corridor; in some cases the known population locations or suitable habitat may not be close to the site.

Table 3–53 lists animal species considered by state and federal resource management agencies as endangered, threatened, or otherwise of concern that may be present in the vicinity of the pipeline corridor. A number of the species listed are potentially present in the vicinity of the corridor; in some cases the known population locations or suitable habitat may not be close to the site.

Table 3–54 lists bird species, including migratory birds, that may occur in the vicinity of the corridor, although on-site habitat limits typical nesting and breeding activities. Most of these species are protected under the MBTA, which prohibits take or destruction of birds, nests, or eggs of listed migratory birds.

The Abert's squirrel (*Sciurus aberti*) and burrowing owl are of primary concern along the pipeline corridor. Ponderosa pine stands in the vicinity of T. 35 S., R. 23 and R. 24 W. (Map 14, Appendix C) likely provide habitat for Abert's squirrel and many sensitive avian species. Burrowing owl habitat has been identified within T. 30 S., R. 23 and R. 24 E., (Map 9, Appendix C) and seasonal restrictions may apply; however, no critical habitat exists within the pipeline corridor.

3.4.19.7 Land Use

The proposed pipeline corridor south from the Moab site to the White Mesa Mill site is approximately 89 miles and would cross federal, state, and private land. Where possible, the pipeline would be constructed in the existing right-of-way. Where co-location was not possible or practical, the slurry pipeline would parallel existing rights-of-way. Approximately 27 percent of the corridor is administered by BLM and the USFS. Approximately 54 percent of the route is located on private and Nature Conservancy lands; the remaining 19 percent is under the jurisdiction of the state, including wildlife reserves.

3.4.19.8 Cultural Resources

The cultural history of the White Mesa Mill pipeline route is discussed in the more general cultural history of southeastern Utah described in Section 3.1.13.1; the Class I cultural resource inventory that was conducted for the corridor is described in Section 3.1.13.2.

The Class I inventory (Davis et al. 2003) indicates that Class III surveys have been conducted along most of the proposed pipeline route. An approximately1.5-mile section of the pipeline corridor north and south of the proposed pumping station (Map 8, Appendix C) has not been surveyed, and an approximately 8.5-mile section of the pipeline corridor from Dodge Point (Map 13, Appendix C) to Mustang Mesa (Map 15, Appendix C) has not been completely surveyed. Davis et al. (2003) estimate that, within these unsurveyed areas, approximately 127 sites per square mile could be expected to occur. Of the 127 sites, approximately 79 percent, or 100 sites, would be eligible for inclusion in the National Register of Historic Places.

Within the 1-mile-wide corridor along the entire pipeline corridor, approximately 203 cultural sites have been documented. Of this total, approximately 104 are considered eligible for inclusion in the National Register of Historic Places. Table 3–55 summarizes the types of cultural sites that are eligible for inclusion. The time periods represented by the sites range primarily from the prehistoric Archaic to the Pueblo III periods (7000 B.C.–A.D. 1300); however, the protohistoric and historic periods are represented by a number of sites.

A distinctive trend in cultural site densities occurs north to south along the length of the pipeline corridor. In the northern 10-mile section of the corridor, between Moab and the southern end of Spanish Valley (Map 6, Appendix C), typical site densities are 2.9 sites per linear mile. This area lacks the physical attributes that are deemed essential for long-term prehistoric habitation. Accordingly, the types of cultural sites documented in this section indicate a relatively transient use by prehistoric and protohistoric groups.

Table 3–55. White Mesa Mill Pipeline—Summary of Eligible Cultural Sites by Type

Site Type	Number of Sites
Temporary Camp	17
Long-Term Camp	1
Habitation Site	13
Limited Activity Site	21
Granary	7
Rock Art	1
Quarry	10
Road	5
Homestead	1
Unknown	28
Total	**104**

Along the middle section of the pipeline corridor, between the southern end of Spanish Valley and Peters Canyon (Map 10, Appendix C), cultural site densities average 8 sites per linear mile. This area contains a wide variety of bedrock exposures containing rock types that were exploited by prehistoric groups for the manufacturing of stone tools. The types of cultural sites documented in this area indicate that prehistoric groups used this area primarily for short-term activities such as lithic quarrying, tool manufacturing, and hunting and gathering of local natural resources.

The southern section of the pipeline corridor, between Peter's Canyon and the White Mesa Mill site, contains the highest density of cultural sites along the corridor. Within this section of the corridor, Class III surveys have been incomplete or nonexistent. As previously noted, Davis et al. (2003) estimated densities of approximately 127 sites per square mile in the Dodge Point/Mustang Mesa area. In the Recapture Wash area north of Blanding, archaeologists (Davis et al. 2003) documented an average of 56 cultural sites per square mile, and on White Mesa, Davis et al. (2003) documented an average of 34 cultural sites per square mile.

Recent interviews (Fritz 2004, in progress) with tribal members indicate that at least one potential traditional cultural property, a sacred ceremonial site, associated with the Ute Tribe exists along the proposed pipeline corridor. This is a "potential" traditional cultural property because its eligibility for National Register status has yet to be determined; this determination would be made during the Section 106 consultation process. The potential for the existence of additional traditional cultural properties and their estimated density are extremely high (on a scale of low-medium-high-extremely high); such properties would likely be associated with the Ute Tribe, Navajo Nation, and Hopi Tribe (Fritz 2004, in progress). Traditional cultural properties along the route may include sacred gathering areas, sacred healing areas, sacred springs, and burial areas.

3.4.19.9 Visual Resources

The 87-mile-long proposed pipeline corridor between the Moab and White Mesa Mill sites passes through areas designated primarily as Class III by BLM (see Section 3.1.15 for an explanation of visual resource classes). Approximately 20 percent of the route is classified as Class IV (south of Monticello and south of Blanding), and approximately 5 percent of the route is classified as Class II (Kane Springs Canyon, approximately 10 miles southeast of Moab; Long Canyon, approximately 10 miles northeast of Blanding; and Recapture Creek, approximately 3.5 miles northeast of Blanding).

A variety of visual settings occur throughout the Class III areas. Between Moab and Monticello, much of the landscape is characterized by gently to moderately rolling terrain that is abruptly dissected by dry, rocky arroyos. The predominantly red sandy soils are covered by moderately sparse vegetation composed of sagebrush, rabbitbrush, bunchgrasses, cheatgrass, piñon-pine, and juniper. Interspersed among the rolling hills are numerous red and beige sandstone outcrops, some occurring as isolated butte-like "islands" and others appearing as linear ridges and cliffs. Between Monticello and Blanding, the Class III areas are characterized more by rough-textured hills, ridges, and valleys that are thickly vegetated with sagebrush, piñon-pine, and juniper.

The Class IV areas south of Monticello and south of Blanding have been culturally modified by farming and ranching. The landscape is a gently to moderately rolling patchwork of plowed fields, green pastures, and cultivated wheat and alfalfa fields. Soils are predominantly red or dark reddish brown.

The Class II areas—Kane Springs Canyon, Long Canyon, and Recapture Creek—are characterized by steep, dissected canyons. The Kane Springs Canyon area contains the rugged red and beige ridges and cliffs of the Entrada Sandstone. These rocky ridges are sparsely vegetated with sagebrush and juniper. The canyons of Long Canyon and Recapture Creek are formed by the somewhat less rugged sandstone ridges and cliffs of the Burro Canyon Formation and Dakota Sandstone. The yellow-brown and tan rocks of these strata are covered with moderately dense piñon and juniper. Figure 3–44 and Figure 3–45 are photographs of the proposed pipeline crossings within Kane Springs Canyon and Recapture Creek, respectively.

Approximately 25 percent of the pipeline corridor, including those portions that cross Kane Springs Canyon and Recapture Creek, is visible to travelers on US-191. A 3- to 4-mile segment of the route that skirts the southwestern slope of Spanish Valley (Map 5, Appendix C) is visible to Moab residents and local traffic. The remaining 75 percent of the route is not visible to the general public.

3.5 Borrow Areas

Different types of borrow materials would be needed for cover materials. These materials range from silts and clays to riprap, or rock materials, that would be used to armor the sides of the disposal cell. Borrow areas that would provide these materials have been identified for each disposal alternative (see Figure 2–8). In some cases, a proposed borrow area would be used for more than one disposal alternative. Two of the proposed borrow areas (LeGrand Johnson and Papoose Quarry) are existing quarries, and specific information on rock materials present has been well documented. The proposed Floy Wash borrow area is near pits previously used by UDOT for highway materials. All other proposed borrow sources were selected on the basis of geologic reports and have not been field tested.

Once a disposal site was selected, the proposed borrow areas for that site would be evaluated for suitability by digging test pits and sampling boreholes. Borrow areas selected for analysis constitute an area larger than would be used. This would allow a contractor enough area to adequately test and configure the borrow area for project needs. For example, if the actual deposit of borrow material were not as deep as anticipated, a larger surface area would be required than if the deposit were thicker than anticipated. A larger area also would allow the contractor greater flexibility to avoid any sensitive resources encountered. Figure 2–8 shows the locations of the borrow areas.